Effect of Thermal Shock on the Blood Physiology and Respiratory Response in a Coastal Fish Species: Long Whiskers Catfish (*Mystus gulio*)

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Roll No.: 0123/05

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Session: 2023-2024

A thesis submitted in the partial fulfillment of the requirements for the degree of Master of Science in Fish Biology and Biotechnology

Department of Fish Biology and Biotechnology

Faculty of Fisheries

Chattogram Veterinary and Animal Sciences University

Chattogram-4225, Bangladesh

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Authorization

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The author

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This is to certify that we have examined the above Master's thesis and have found that is complete and satisfactory in all respects and that all revisions required by the thesis examination committee have been made

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Abstract

Climate change has emerged as a major driver of environmental stress, altering aquatic ecosystems through rising temperatures, hypoxia, and other stress-inducing factors. These changes significantly affect the physiology, behavior, and survival of aquatic species, particularly in coastal regions. Long Whiskers Catfish (*Mystus gulio*), a prominent coastal species, is widely distributed and holds significant potential for coastal aquaculture in South Asian countries including Bangladesh. This study evaluates the impact of thermal shock on the physiological and respiratory functions of *Mystus gulio*, an ecologically and economically important coastal fish species. The species were subjected to rapid temperature changes—cold shock at 21°C and heat shock at 34°C—under low oxygen (hypoxic) conditions. The study recorded notable declines in dissolved oxygen levels and oxygen saturation, accompanied by a significant increase in oxygen consumption and opercular movements, indicating heightened respiratory activity under stress. Hematological assessments revealed a marked rise in glucose and white blood cell counts, while hemoglobin, cholesterol, and red blood cell levels were significantly reduced. Additionally, various erythrocytic abnormalities, including spindle-shaped, tear-drop, elongated, twin and triplet cells, along with erythrocytic nuclear irregularities such as micronuclei, notched nuclei, nuclear degeneration, and dead cells, were observed. These physiological disruptions underscore the vulnerability of *M. gulio* to sudden temperature fluctuations in hypoxic conditions, a challenge amplified by the growing frequency of extreme weather events linked to climate change. The findings emphasize the urgent need for climate-resilient aquaculture practices to minimize thermal stress and ensure the sustainability of coastal fisheries.

Keywords: *Mystus gulio*, thermal shock, hypoxia, hemato-biochemical, aquaculture